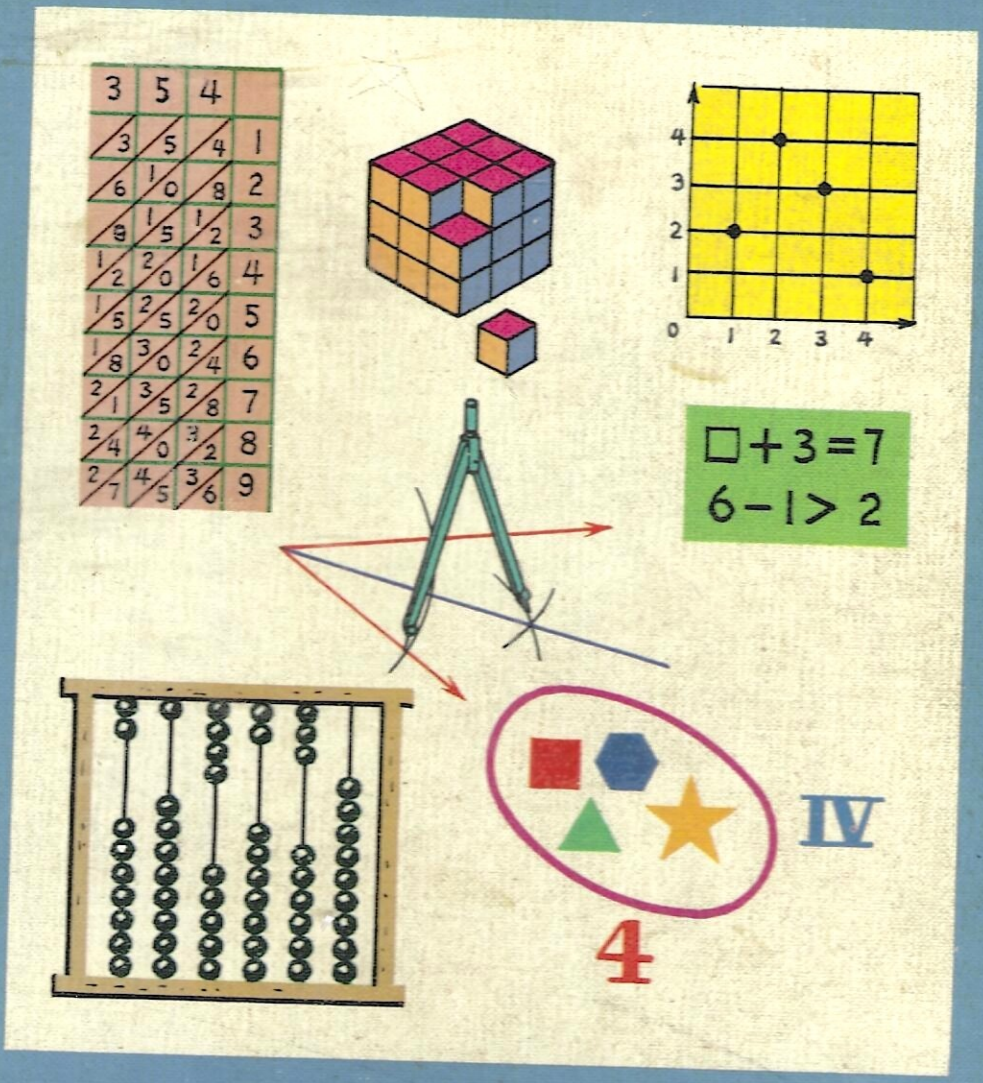
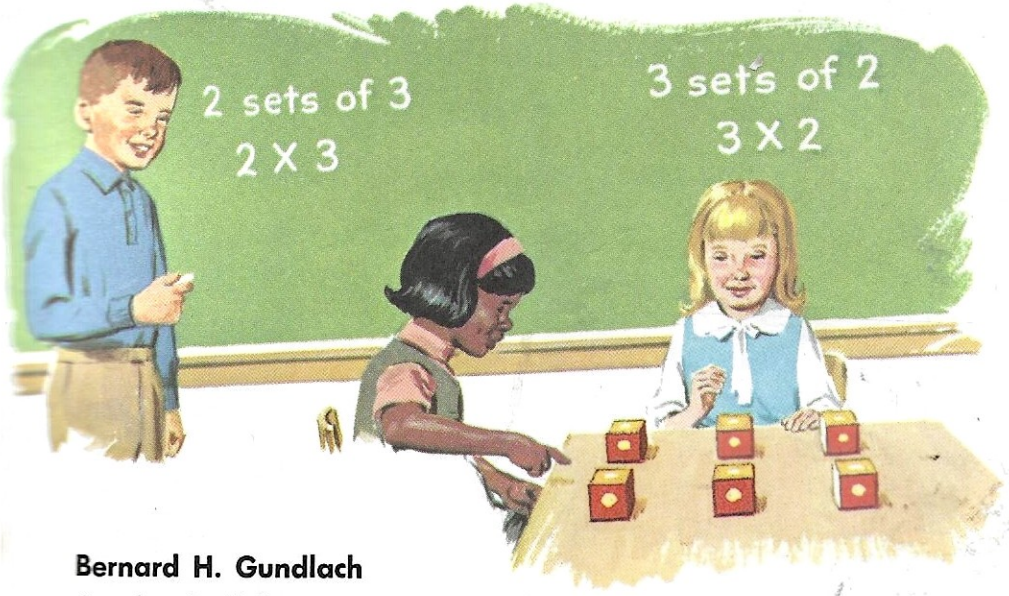
MATHEMATICS 3



MATHEMATICS 3



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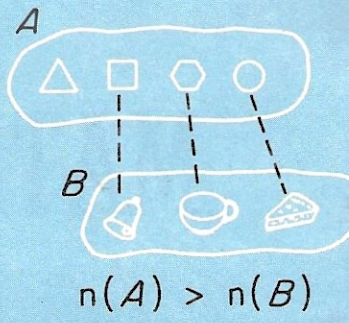
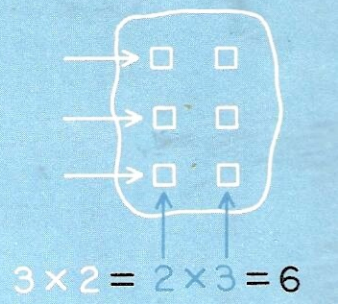
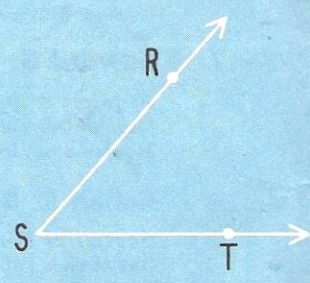
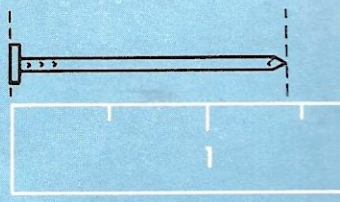
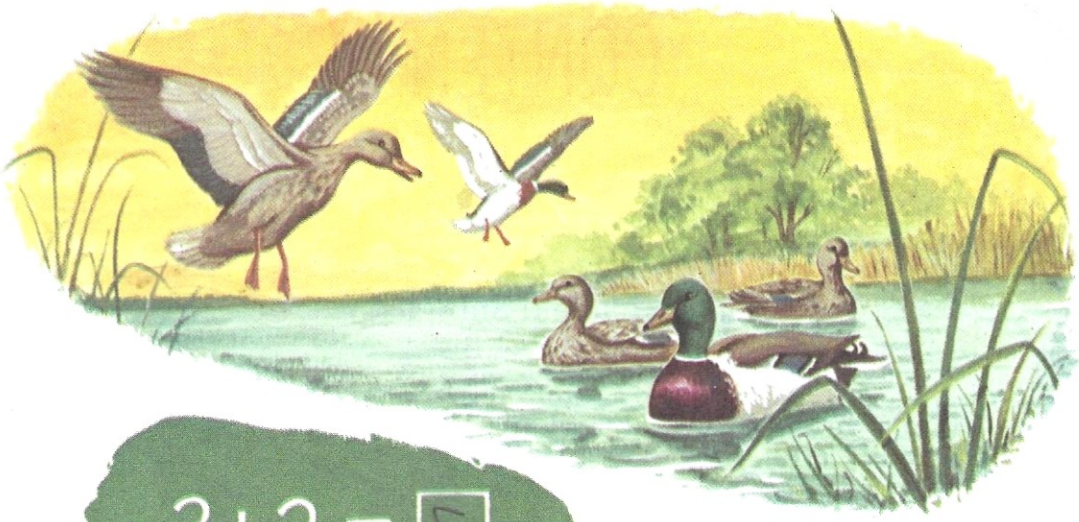


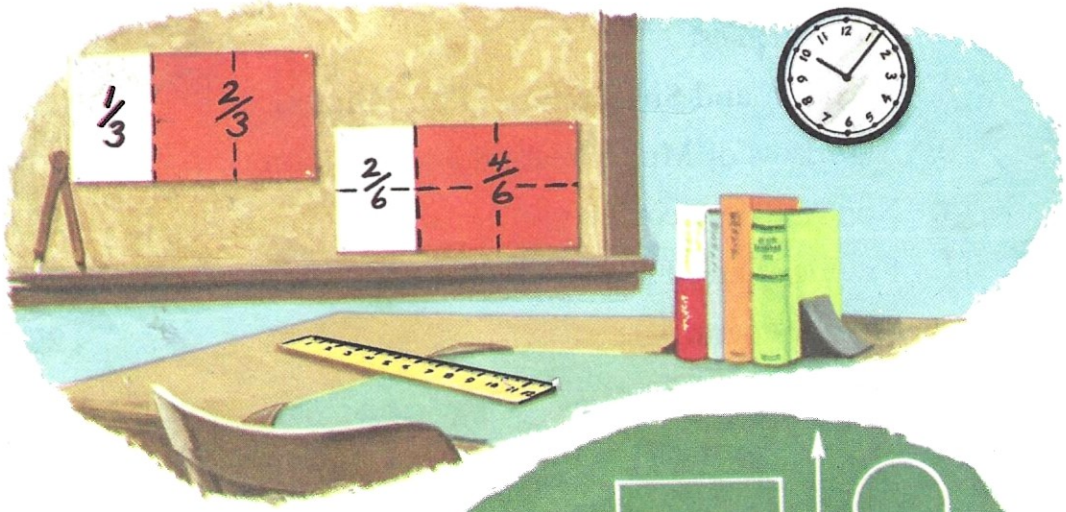


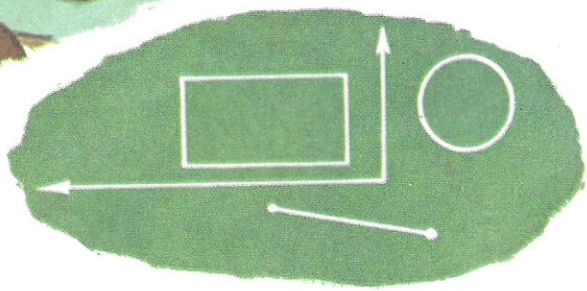






$3+2=\square$ 5

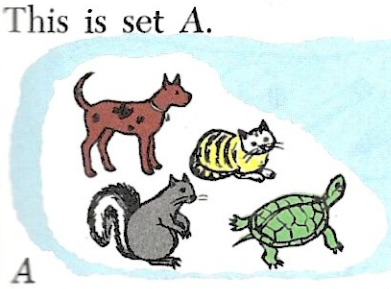




Chapter 1
BASIC CONCEPTS

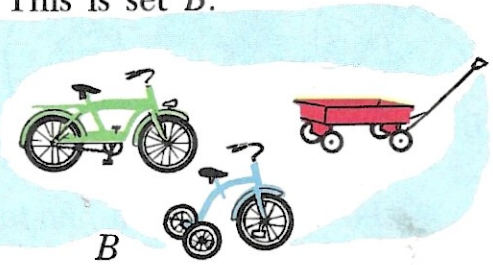
The Number of a Set

This is set A.



A

This is set B.



B

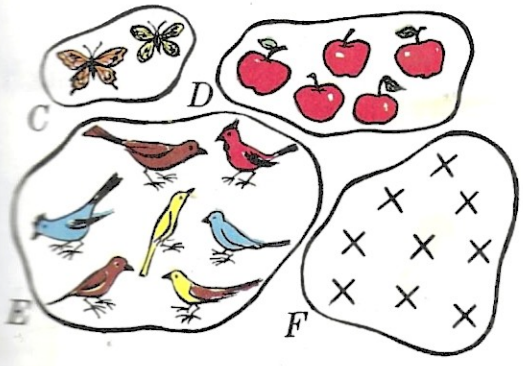
Count the objects of set A and name the number. We call that number **the number of set A.**

We can shorten **the number of set A** to $n(A)$. We read $n(A)$ as *the number of set A.*

Do $n(A)$ and 4 name the same number? Is $n(A)=4$?

What numeral does $\square$ stand for in $n(B)=\square$?

Oral Name the number of each set shown below.



Written Copy. Replace each $\square$ with a correct numeral.

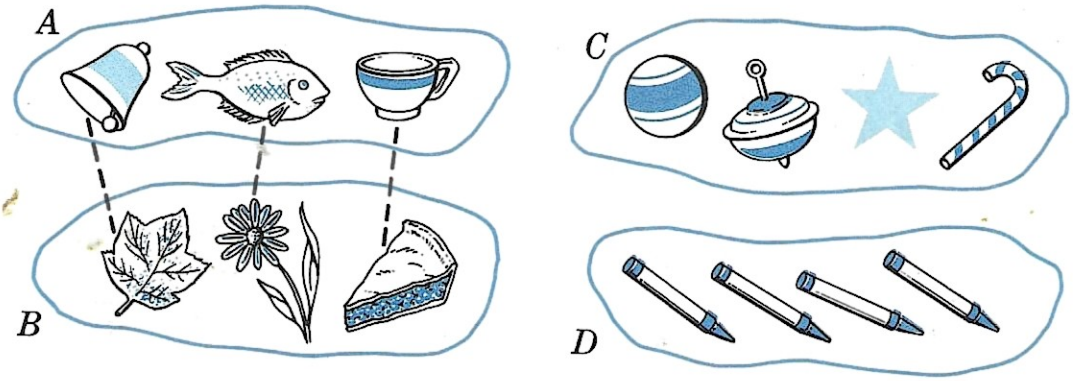
	a	*b*
1.	$n(C)=\square$	$\square=n(E)$
2.	$n(D)=\square$	$\square=n(F)$

Draw the following sets.

3. Set H such that $n(H)=6$
4. Set K such that $n(K)=8$

MORE PRACTICE PAGE 297

Equivalent Sets

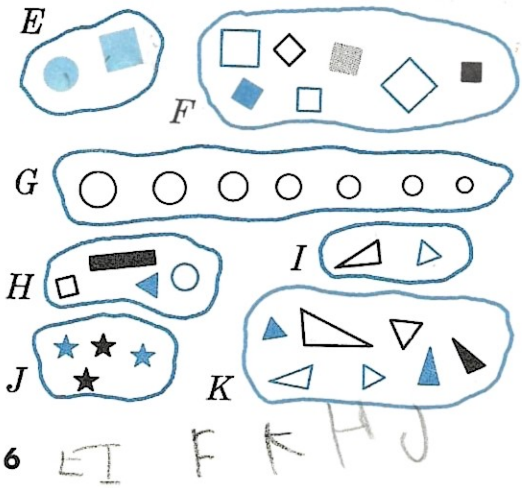


Is set A matched *one-to-one* with set B? We say that set B has the *same* number as set A. We write this as $n(A)=n(B)$. A and B are called **equivalent sets.**

Does $n(C)=n(D)$? Are C and D equivalent sets?

Equivalent sets have the same number.

Oral Name the number of each set below. Name the pairs of sets that have the same number. Which sets are equivalent?



Written Do the following for the sets shown in *Oral*.

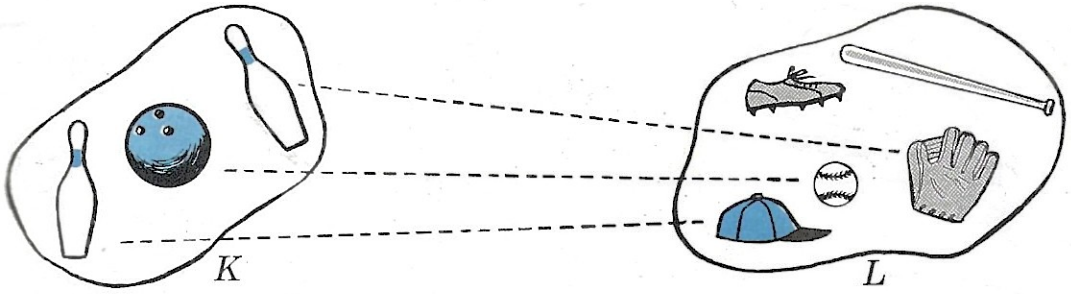
1. For each pair of equivalent sets, write a number sentence like $n(A)=n(B)$ above. For example, $n(E)=n(I)$.

2. Draw 2 sets, L and M, such that $n(L)=5$ and $n(M)=5$.

3. Draw 2 sets, P and Q, such that $n(P)=8$ and $n(Q)=8$.

4. Draw 2 sets, R and S, such that $n(R)=9$ and $n(S)=9$.

Non-Equivalent Sets

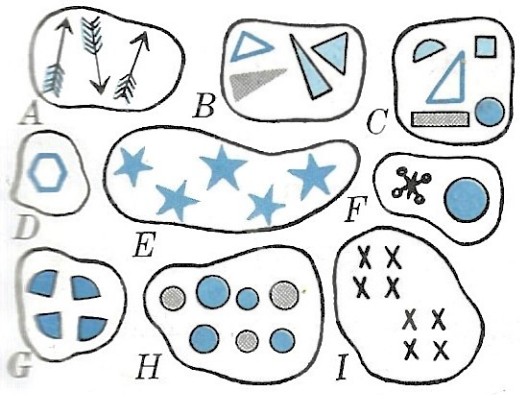


Can set K be matched one-to-one with set L? Are these two sets equivalent?

We cannot use = to write a number sentence for K and L. Why not? We can use $<$, meaning *is less than*. We can write $n(K)<n(L)$. Read it as *the number of set K is less than the number of set L.*

Or we can write $n(L)>n(K)$. Read it as *the number of set L is greater than the number of set K.*

Oral Which sets shown below have a number less than $n(B)$? Greater than $n(B)$?

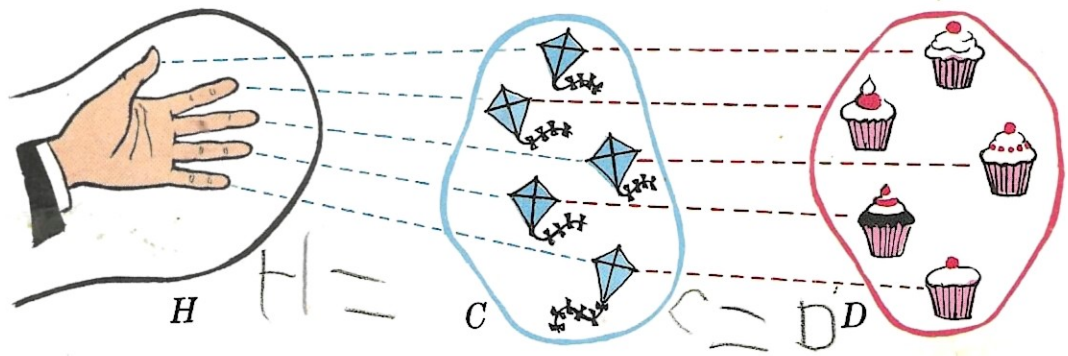


Written Write each number sentence. Replace each ● with =, $<$, or $>$ so the sentence becomes true.

	a	*b*
1.	$n(A)$ ● $n(B)$	$n(H)$ ● $n(I)$
2.	$n(A)$ ● $n(H)$	$n(B)$ ● $n(G)$
3.	$n(H)$ ● $n(A)$	$n(F)$ ● $n(C)$
4.	$n(D)$ ● $n(E)$	$n(D)$ ● $n(B)$
5.	$n(E)$ ● $n(A)$	$n(B)$ ● $n(H)$

MORE PRACTICE PAGE 297

A Set of Equivalent Sets

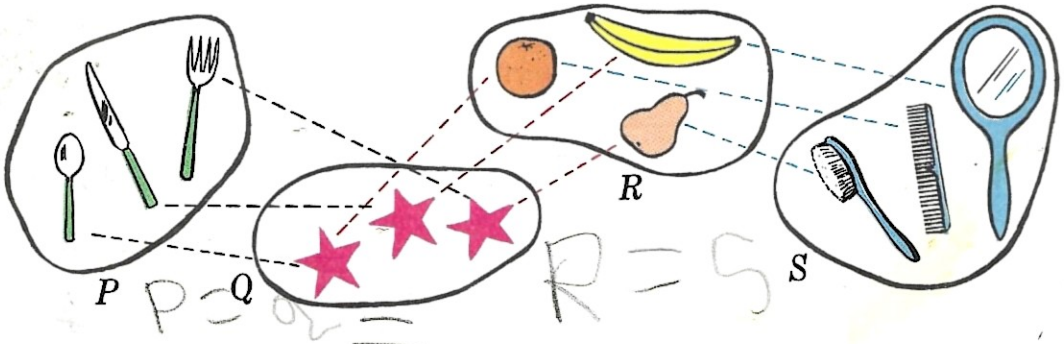


Look at sets H, C, and D. Is $n(H)=n(C)$? Why?

Is $n(C)=n(D)$? Why? Is $n(H)=n(D)$?

What is alike about these sets?

What is the number of each of the sets H, C, and D?



Look at sets P, Q, R, and S. Is $n(P)=n(Q)$?

Is $n(Q)=n(R)$? Is $n(R)=n(S)$? Give reasons.

What is alike about these sets?

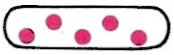
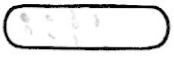
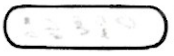
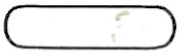
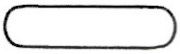
What is the number of each of the sets P, Q, R, and S?

All sets that can be matched one-to-one are called equivalent sets.

Oral What is the number of a set equivalent to the set containing the following?

1. Your nose
2. Your eyes
3. Your ears
4. The legs of a dog
5. The vowels of the alphabet
6. All of your fingers
7. The wheels of a tricycle
8. The months of the year
9. The days of a week

Written Copy and complete each row so that the number word and the numeral name the number of the set in that row.

	Set	*Number Word*	*Numeral*
1.		five	5
2.		six	6
3.		three	3
4.		seven	7
5.		four	4
6.		nine	9
7.		zero	
8.			
9.			8
10.			

Tell why Suppose you have sets J, K, and L such that $n(J) = n(K)$ and $n(K) = n(L)$. What can you say about $n(J)$ and $n(L)$? Tell why.

Another way We can use braces { } instead of rings to show sets. Set Q on page 8 can then be shown as

$Q = \{\bigstar\bigstar\bigstar\}$

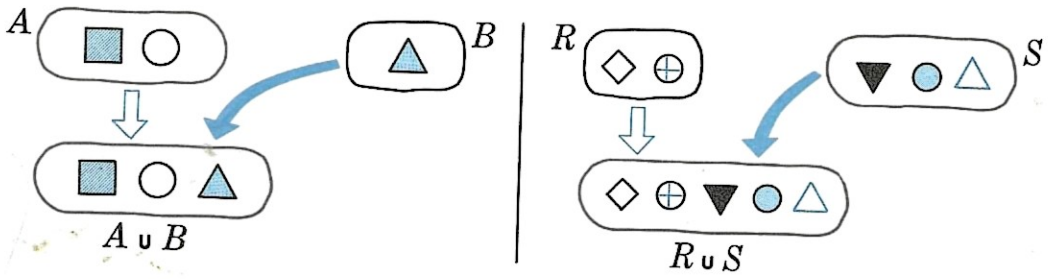
The set of the whole numbers less than five can be shown as

$\{0, 1, 2, 3, 4\}$.

Use braces to show each of the following sets.

1. The first four letters of the alphabet
2. The whole numbers from five through ten
3. The set that contains only the letter g
4. A set that contains no objects

The Union of Two Sets



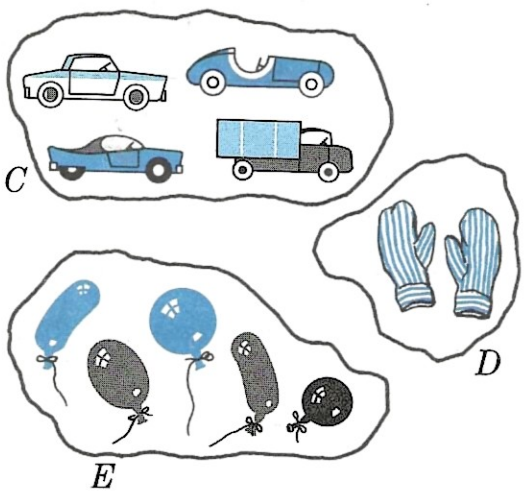
We can join set B to set A and make a new set. We call the new set A **union** B and name it by $A \cup B$.

$$n(A)=2 \qquad n(B)=1 \qquad n(A \cup B)=2+1$$

$2+1$ is a numeral for the number of A union B. Since $2+1=3$, we call 3 *the simplest numeral* for $n(A \cup B)$.

What is the simplest numeral for $n(R \cup S)$? For $n(R)+n(S)$? Does $n(R)+n(S)=n(R \cup S)$?

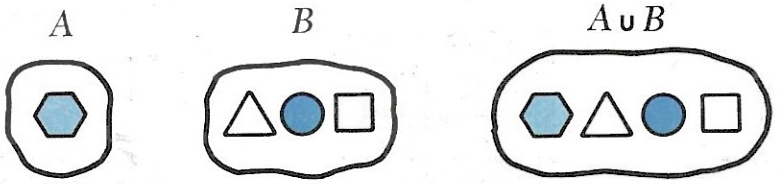
Oral Name the number of the set $C \cup D$; the set $D \cup C$.



Written Write each number sentence and replace the □ by the simplest numeral for the number.

	a	*b*
1.	$n(C \cup E)=$□	$n(C)+n(E)=$□
2.	$n(E \cup C)=$□	$n(E)+n(C)=$□
3.	$n(C \cup D)=$□	$n(C)+n(D)=$□
4.	$n(D \cup C)=$□	$n(D)+n(C)=$□
5.	$n(D \cup E)=$□	$n(D)+n(E)=$□
6.	$n(E \cup D)=$□	$n(E)+n(D)=$□

Addition



$n(A)+n(B)=n(A \cup B)$

Thinking about sets helps you understand addition. What is the simplest numeral for $n(A)$? For $n(B)$? For $n(A \cup B)$?

Instead of $n(A)+n(B)=n(A \cup B)$ we can write:

$1 + 3 = 4$

addend addend sum

or

$$\begin{array}{r} 1 \leftarrow \text{addend} \\ +3 \leftarrow \text{addend} \\ \hline 4 \leftarrow \text{sum} \end{array}$$

The numbers being added are called **addends.** The resulting number is called the **sum.**

In $1+3=4$, the numerals $1+3$ and 4 are two names for the sum. The sum is the number four.

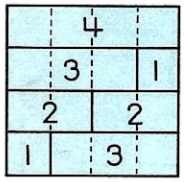
Oral For each example below, tell which numbers are addends and which number is the sum.

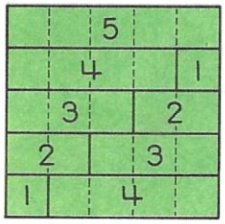
	a	*b*
1.	$3+2=5$	$1+2=3$
2.	$4=1+3$	$2=1+1$
3.	$\begin{array}{r} 1 \\ +3 \\ \hline 4 \end{array}$	$\begin{array}{r} 3 \\ +2 \\ \hline 5 \end{array}$

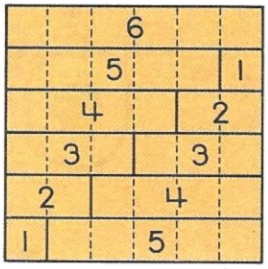
Written Copy. Find each sum.

	a	*b*
1.	$2+1=\square$	$\square=1+2$
2.	$2+2=\square$	$\square=3+1$
3.	$4+1=\square$	$\square=3+2$
4.	$3+1=\square$	$\square=2+1$
5.	$\begin{array}{r} 1 \\ +1 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ +3 \\ \hline \end{array}$

Many Numerals for the Same Number







The numerals 4, 3+1, and 2+2 are all names for the number four. Numerals like 3+1 and 2+2 are called **addition numerals.**

One way of naming numbers is by using addition numerals.

Oral Use the number squares above to answer the following.

1. Name all the addition numerals for the number four.

2. Name all the addition numerals for the number five.

3. Name all the addition numerals for the number six.

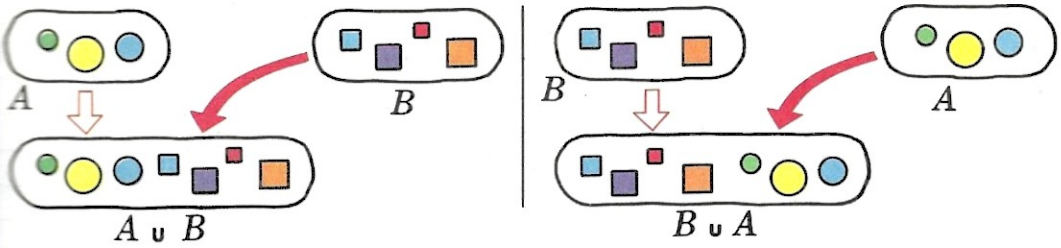
Written Write each number sentence and replace □ with the simplest numeral.

	a	*b*
1.	1+3=□	3+1=□
2.	2+2=□	□=2+2

Write each number sentence and replace □ with the simplest numeral to make the sentence true.

	a	*b*
3.	1+□=4	□+1=4
4.	2+□=4	□+2=4
5.	3+□=4	□+3=4
6.	4+1=□	1+4=□
7.	3+□=5	□+3=5
8.	1+□=5	□+1=5
9.	□+1=6	1+5=□
10.	□+2=6	□+4=6

Addition Is Commutative



Do you get the same set whether you join B to A or join A to B?

What can you say about $A \cup B$ and $B \cup A$?

What can you say about $n(A \cup B)$ and $n(B \cup A)$?

Is $n(A)+n(B)=n(B)+n(A)$? Is $3+4=4+3$?

Changing the order of two addends does *not* change the sum. We call this idea the **commutative property of addition.** Or we say that *addition is commutative.*

Oral Name the simplest numeral with which to replace ☐ to make each sentence below true.

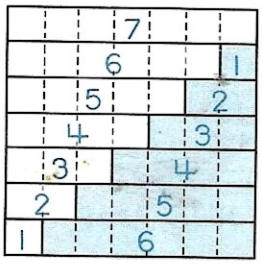
	a	*b*
1.	$3+7=7+\square$	$9+3=\square+9$
2.	$5+\square=6+5$	$\square+8=8+3$
3.	$\square+1=1+6$	$2+\square=7+2$
4.	$7+5=\square+7$	$8+4=4+\square$
5.	$\square+1=1+2$	$4+5=\square+4$
6.	$0+\square=5+0$	$6+3=3+\square$

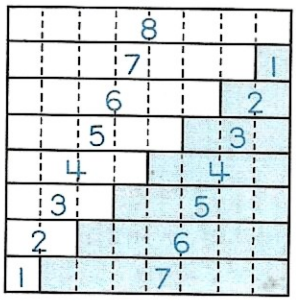
Written Change the order of the addends to write another addition numeral for each of the numbers.

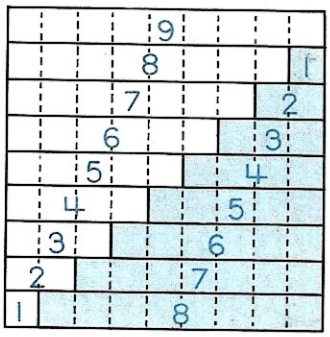
	a	*b*	*c*
1.	$3+5$	$6+1$	$1+4$
2.	$4+5$	$2+7$	$5+1$
3.	$8+1$	$4+2$	$3+6$
4.	$2+3$	$3+4$	$6+2$

Tell why What replacements for ☐ make $4+\square=\square+4$ true?

Many Numerals for the Same Number







Oral Use the number squares above to check your answers for the following.

1. Name all addition numerals you can for 7, for 8, and for 9.

2. How many addition numerals are there for 7? For 8? For 9?

Written Copy. Replace each ☐ by the simplest numeral.

	a	*b*
1.	2+☐=7	3+☐=8
2.	3+☐=7	4+☐=8
3.	4+☐=7	5+☐=8
4.	☐+1=7	☐+1=8
5.	☐+5=7	☐+6=8
6.	☐+6=7	☐+7=8
7.	3+☐=9	4+☐=9
8.	5+☐=9	7+☐=9
9.	☐+2=9	☐+7=9
10.	☐+8=9	☐+6=9

MORE PRACTICE PAGE 298

Can you do this? An *even number* can be named by an addition numeral with both addends the same. Since 6 can be named as 3+3 (both addends the *same*), we say 6 is an even number.

If a number cannot be named by an addition numeral with both addends the same, we say it is an *odd number*.

Name all of the even numbers from 1 through 10. Then name all of the odd numbers from 1 through 10.

Open and Closed Sentences

Bob is a 3rd grade pupil. $3+4=7$

Are the sentences above "True" or "False"? Since you can tell whether they are true or false, both of these sentences are called **closed sentences.**

He is a 3rd grade pupil. $\square=2+5$

Are these sentences "True" or "False"? You cannot tell whether they are true or false until *He* or $\square$ is replaced by a definite name. Both of these sentences are called **open sentences.**

Oral Which of the following are closed sentences? Open sentences?

1. $7+2=9$
2. He is president.
3. $5+\square=8$
4. George Washington was our first president.
5. $3+5=8$

Written Change each of the following open sentences into a closed sentence that is true. Then change each of them into a closed sentence that is false.

1. $5+4=\square$
2. $2+\square=8$
3. She is my teacher.
4. It is the number of the set of all my fingers.
5. $5+1=\square$

Can you do this? Think of the open sentence $6+\square=9$. We can replace $\square$ by 3 to make a true sentence.

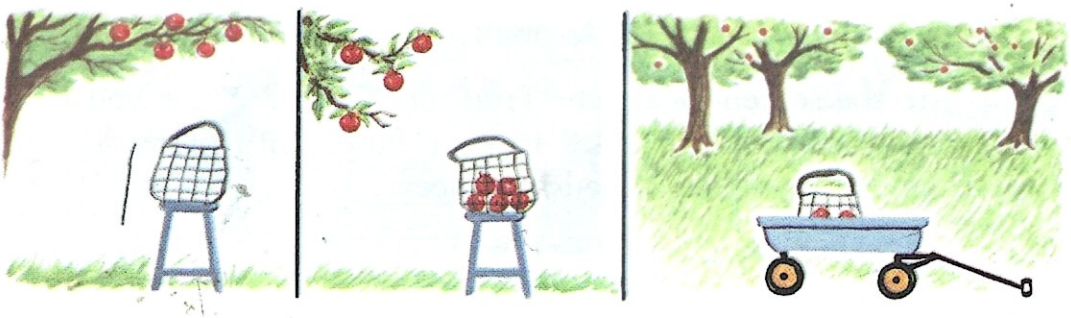
Can you replace $\square$ by any other numeral and make a true sentence?

Replace $\square$ by a numeral to make a false sentence.

In how many ways can you make $6+\square=9$ a true sentence? A false sentence?

MORE PRACTICE PAGE 298

Problem Solving



Jim picked 5 apples from one tree.
He picked 4 apples from another tree.
How many apples did he pick all together?

You can solve the problem by writing a single open sentence for the problem. Use $\square$ for the numeral that names the number of apples Jim picked all together.

We might think of the apples from the second tree as being joined to those from the first tree. Joining sets suggests adding their numbers. Then we could write the open sentence $5+4=\square$.

We could also think of the apples from the first tree as being joined to those from the second tree. Then we could write the open sentence $4+5=\square$.

Either open sentence is correct. The choice is yours.

Solve the open sentence. This means to replace the $\square$ with the simplest numeral that makes the closed sentence true.

$5+4=9$ $\qquad$ $4+5=9$

Finally, answer the problem. *Jim picked 9 apples all together.*

Oral State two open sentences for each of the following problems.

1. Mark had 3 baseball cards. He got 4 more from Fred. How many baseball cards did he have then?

2. Susan invited 5 boys and 3 girls to her birthday party. How many children did she invite?

3. Robert went fishing. He caught 4 fish before noon and 4 more after noon. How many fish did he catch in all?

4. Alice picked 2 yellow roses and 4 red roses for her mother. How many roses did she pick?

5. Jean found 4 shells on the beach and 5 shells in the water. How many shells did she find?

6. There were 6 cars in the parking lot. Then 3 more cars parked in the lot. How many cars were in the parking lot then?

7. Tom left home with 7 marbles. On his way to school he found 2 marbles. How many marbles did he have when he got to school?

8. Marvin mailed 6 letters for his father and 1 for his mother. How many letters did he mail altogether?

Written Write an open sentence for each of the problems in *Oral*. Solve each open sentence. Write an answer for each problem.

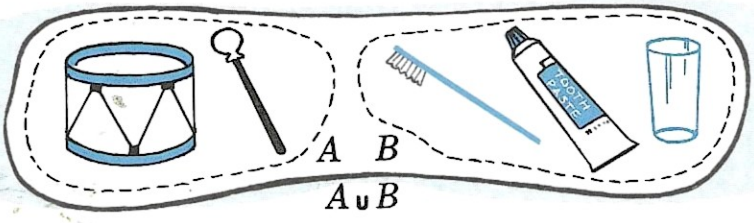
Can you do this? For an open sentence we can make up many story problems. For the open sentence $3+2=\square$ we can make up a problem that tells about joining a set of 2 objects and a set of 3 objects. One such problem might be as follows.

> Richard has 3 sisters and 2 brothers. How many brothers and sisters does he have?

Make up a problem for each of the open sentences below.

	a	*b*
1.	$3+1=\square$	$\square=2+2$
2.	$2+6=\square$	$\square=1+5$
3.	$4+5=\square$	$\square=2+3$
4.	$5+3=\square$	$\square=4+2$

Subsets



The set $A \cup B$ is the union of which two sets?

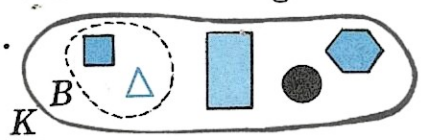
Is every object in set A also in set $A \cup B$?

A is called a **subset** of $A \cup B$.

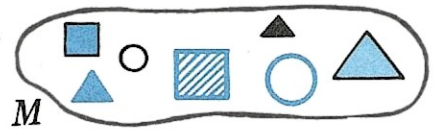
Is every object in set B also in set $A \cup B$?

Is B a subset of $A \cup B$?

Oral Answer the questions below each set drawing.

1. 

Is every object in set B also in set K? Is B a subset of K? Is K a subset of B?

2. 

How many squares are in set M? Is the set of squares a subset of M? Is the set of triangles also a subset of M?

Written Use the following set to write the answer for each of the following.

1. How many subsets of G are shown by the dashed rings?

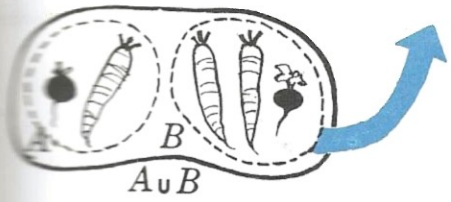
2. What is $n(A)$? What is $n(B)$? What is $n(C)$?

3. Does $n(A)+n(B)+n(C)=n(G)$?

4. Is $A \cup B$ a subset of G?

5. Is $B \cup C$ a subset of G?

Subtraction



Removing subset B from $A \cup B$ leaves what subset?

$$n(A \cup B) - n(B) = n(A)$$

Thinking about sets helps you understand subtraction.

What is the number of $A \cup B$? Of A? Of B?

Instead of $n(A \cup B) - n(B) = n(A)$, we can write:

$5 - 3 = 2$ or

$$\begin{array}{r} 5 \leftarrow \text{minuend} \\ -3 \leftarrow \text{subtrahend} \\ \hline 2 \leftarrow \text{difference} \end{array}$$

The number subtracted from is called the **minuend.** The number being subtracted is called the **subtrahend.** The resulting number is called the **difference.** Numerals like $5-3$ and $8-4$ are called **subtraction numerals.**

In $5-3=2$, the numerals $5-3$ and 2 are two names for the difference. The difference is the number two.

Oral For each subtraction below, tell which number is the minuend, which number is the subtrahend, and which number is the difference.

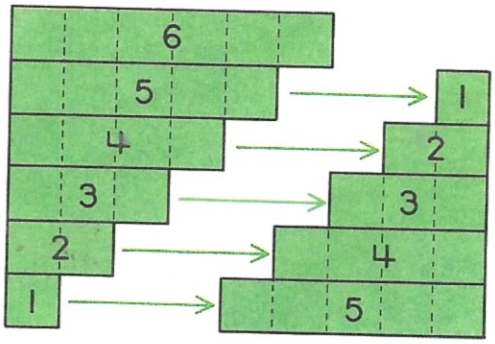
a	*b*	*c*
$\begin{array}{r} 4 \\ -1 \\ \hline 3 \end{array}$	$\begin{array}{r} 3 \\ -2 \\ \hline 1 \end{array}$	$\begin{array}{r} 4 \\ -2 \\ \hline 2 \end{array}$

Written Find each difference.

	a	*b*
1.	$2-1=\square$	$\square=3-2$
2.	$5-3=\square$	$\square=4-1$
3.	$3-1=\square$	$\square=5-4$
4.	$\begin{array}{r} 5 \\ -2 \\ \hline 3 \end{array}$	$\begin{array}{r} 4 \\ -3 \\ \hline 1 \end{array}$

MORE PRACTICE PAGE 299

Subtraction Undoes Addition



$\square + 1 = 6$ $\quad 6 - 1 = \square$

$\square + 2 = 6$ $\quad 6 - 2 = \square$

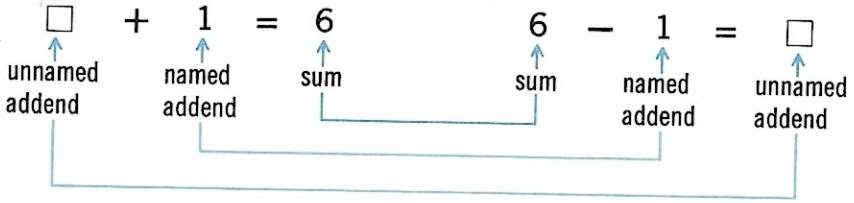
$\square + 3 = 6$ $\quad 6 - 3 = \square$

$\square + 4 = 6$ $\quad 6 - 4 = \square$

$\square + 5 = 6$ $\quad 6 - 5 = \square$

What numeral should replace the $\square$ in each sentence?

In $\square + 1 = 6$, one of the addends is *named* by a numeral. The other addend is not named by a numeral, only by a $\square$. We say this addend is *unnamed*. We can use subtraction to find an *unnamed* addend.



Oral Tell which numeral should replace the $\square$ in each sentence below.

1. $2 + 3 = 5$ and $5 - 3 = \square$
2. $3 + 1 = 4$ and $4 - 1 = \square$
3. $2 + 6 = 8$ and $8 - 6 = \square$
4. $5 - 1 = 4$ and $4 + 1 = \square$
5. $7 - 5 = 2$ and $2 + 5 = \square$

Written For each sentence, write a subtraction sentence. Then find the unnamed addend.

	a	*b*
1.	$\square + 3 = 7$	$\square + 3 = 8$
2.	$\square + 5 = 6$	$\square + 4 = 6$
3.	$\square + 2 = 9$	$\square + 5 = 9$
4.	$\square + 4 = 8$	$\square + 4 = 7$

Finding Unnamed Addends

How can we find the unnamed addend in $3+\square=7$?

Since addition is commutative, $3+\square=\square+3$.

We can use subtraction to find the unnamed addend.

Subtract 3 from 7.

$3+\square=7$

$\square+3=7$

$\square=7-3$

$\square=4$

Oral Tell which numeral should replace the $\square$ in each sentence.

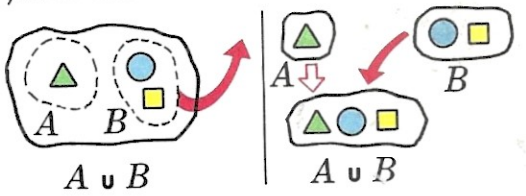
1. $4+5=9$ and $5+\square=9$
2. $3+4=7$ and $\square+3=7$
3. $\square+2=6$ and $2+4=6$

Written For each addition sentence, write a subtraction sentence as shown below. Then find the unnamed addend.

1. $4+\square=9$ $\quad\square=9-4$
2. $3+\square=4$ $\quad\square=$____
3. $2+\square=7$ $\quad\square=$____
4. $1+\square=6$ $\quad\square=$____
5. $5+\square=8$ $\quad\square=$____

Can you do this?

Separate B from A ∪ B $\qquad$ *Join B to A*



$3-2=1$ $\qquad$ $1+2=3$

same

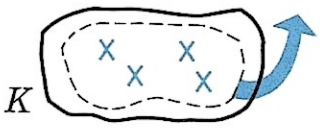
same

same

Find each difference.

	a	*b*
1.	$7-5=\square$	$\square=8-4$
2.	$9-3=\square$	$\square=6-2$
3.	$8-1=\square$	$\square=7-3$

The Number Zero



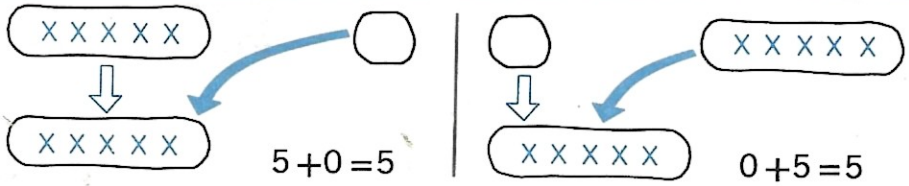
All of set K is removed.

How many objects remain?

When we remove all of set K, no objects remain. We say that what remains is **the empty set.** The *number* of the empty set is *zero*.

We can write $n(K)-n(K)=0$ or $4-4=0$.

When any number is subtracted from itself, the difference is zero.



What can you say about the sum when zero is one of the addends?

Oral Answer each question below.

1. Each of the following subtraction numerals name the same number: $1-1$, $2-2$, $3-3$, $4-4$, $5-5$, $6-6$, $7-7$, $8-8$, $9-9$. What number is it?

2. If one addend is 0 and the other addend is 6, what is the sum?

3. Is $3+0=0+3$? Why?

Written Copy. Replace each $\square$ with the simplest numeral.

	a	*b*
1.	$7-7=\square$	$7-\square=0$
2.	$3-\square=0$	$4-\square=0$
3.	$\square-5=0$	$\square-6=0$
4.	$8-8=\square$	$9-\square=0$
5.	$1+\square=1$	$\square+2=2$
6.	$\square+4=4$	$0+\square=7$

Basic Addition and Subtraction Table

+	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	
2	2	3	4	5	6	7	8	9		
3	3	4	5	6	(7)	8	9			
4	4	5	6	7	8	9				
5	5	6	7	8	9					
6	6	7	8	9						
7	7	8	9							
8	8	9								
9	9									

Addition (to find a sum):

$3+4=\square$

Find 3 in the left column and 4 in the top row. The numeral for the sum is at the intersection of the 3-row and the 4-column.

Subtraction (to find a difference):

$8-2=\square$

Pick the 8 which is in the 2-column. The numeral for the difference is in the left column at the end of this row.

Oral Use the above table to answer these questions.

1. The first 2 rows from the top are the same. Why is this?

2. The first 2 columns from the left are also the same. Why is this?

3. To solve $7-4=\square$ by using the table, which 7 do you pick?

4. To solve $9-5=\square$ by using the table, which 9 do you pick?

Written Copy. Replace each $\square$ with the simplest numeral. Use the table to check your answers.

	a	*b*
1.	$3+4=\square$	$\square=4+3$
2.	$5+4=\square$	$\square=7+1$
3.	$2+6=\square$	$\square=3+5$
4.	$2+7=\square$	$\square=9-2$
5.	$5-2=\square$	$\square=8-6$
6.	$9-3=\square$	$\square=7-5$

MORE PRACTICE PAGE 299

Problem Solving

Jim started home with 9 apples.
On the way, he and Bob ate some apples.
Jim had 5 apples when he got home.
How many apples did Bob and Jim eat?

How do we know some apples were eaten? In the open sentence $9=\square+5$, what does the $\square$ stand for? Remember that $\square+5=5+\square$. Why?

Then $9=\square+5$ can be changed to $9=5+\square$ and then to the subtraction sentence $9-5=\square$.

Oral State an addition sentence for each of the following.

1. Alice started to school with 5 pencils. She lost some pencils on the way and had 3 of them when she got to school. How many pencils did she lose?

2. Richard had 7 butterflies in a jar. He opened the jar and 4 of them flew away. How many butterflies did he have left?

3. Carolyn dropped 8 eggs. All but 3 of them were broken. How many of the eggs broke?

4. Mark bought 9 candy canes. He ate 4 of them. How many candy canes did Mark have then?

Written Write an addition and a subtraction sentence for each problem in *Oral*. Solve either open sentence and write an answer for the problem.

Checkup Time

The numerals in ( ) tell the pages where you can turn for help if you need it.

Important Ideas

1. Equivalent sets have the same number of objects. (6)

2. Non-equivalent sets have different numbers. (7)

3. There are many numerals for the same number. (12, 14)

4. Addition is commutative. (13)

5. Subtraction undoes addition. (20, 21)

Words to Know

1. $(<)$ is less than, $(>)$ is greater than (7)

2. Union of sets, $A \cup B$ (10)

3. Addend, sum (11)

4. Commutative property of addition (13)

5. Open sentence and closed sentence (15)

6. Subset (18)

7. Difference, subtrahend, minuend (19)

Questions to Discuss

1. How can you tell when two sets are equivalent? When two sets are not equivalent? (6, 7)

2. If $n(E)<n(F)$ and $n(F)=7$, how many objects can there be in set E? (7)

3. How can you tell whether a sentence is an open sentence or a closed sentence? (15)

4. How can you solve the equation $5+\square=8$? (20, 21)

5. What is the only number for which $5+\square=5$ and $7-7=\square$ are true sentences? (22)

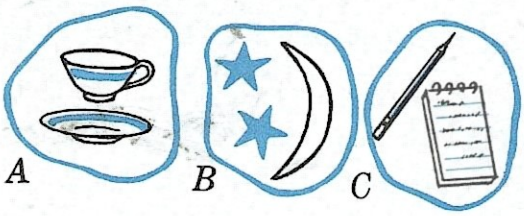
Written Practice

Copy. Replace each $\square$ with the simplest numeral. (11-14, 20-24)

	a	*b*
1.	$5+4=\square$	$\square=2+6$
2.	$\square+3=5$	$8=1+\square$
3.	$2+\square=7$	$4=\square+2$
4.	$8-4=\square$	$\square=9-3$

Self-Evaluation

Part 1 Think about matching the following sets one-to-one.



Copy each sentence below and replace ● by =, <, or >.

	a	*b*
1.	n(*A*) ● n(*B*)	n(*A*) ● n(*C*)
2.	n(*B*) ● n(*C*)	n(*B*) ● n(*A*)
3.	n(*C*) ● n(*A*)	n(*C*) ● n(*B*)

Part 2 Copy. Replace each □ with the simplest numeral to make the sentence true.

	a	*b*
1.	1+5=□	□+4=7
2.	8−3=□	2+□=9
3.	9−5=□	□=3+5
4.	4+4=□	□+3=3
5.	6−6=□	7+□=7
6.	3+0=□	□=5−2
7.	0+8=□	3+□=6

Part 3 Read each problem carefully. Write an open sentence for it. Solve the open sentence. Write an answer for the problem.

1. John read 4 stories yesterday and 3 today. How many stories did he read in the 2 days?

2. There were 9 goldfish in a bowl. Jane could see only 6 of them. How many goldfish could she not see?

3. There are 7 girls in Mary's Brownie Troop. At a meeting 2 of the girls stayed home. How many girls came to the meeting?

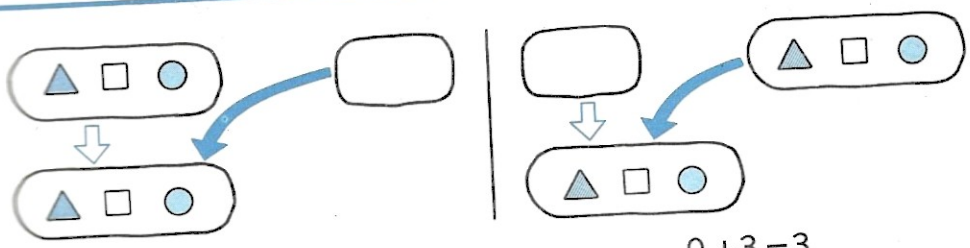
4. Pam walked 2 blocks to her friend's house. Then they walked 3 blocks to school. How far did Pam walk?

5. Roger had 8 pennies. He bought some candy and had 3 pennies left. How many pennies did he spend?

6. Kathy worked 4 addition problems and 4 subtraction problems. How many problems did she work in all?

Chapter 2
PATTERNS OF ADDITION AND SUBTRACTION

The Identity Number of Addition



$3+0=3$ $\qquad$ $0+3=3$

Is a set changed when the empty set is joined to it? Is a set changed when it is joined to the empty set? If one of two addends is zero, what is the sum?

Adding zero to any number does not change the number. Because of this special property, we call zero the **identity number of addition.**

Oral Answer the following.

1. Why is zero called the identity number of addition?
2. Join the empty set to the empty set. What is the result?
3. $0+0$ equals what number?
4. What number must you add to 7 so the sum is 7?
5. What number must you add to 0 so the sum is 7?

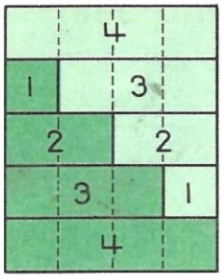
Written Copy and solve.

	a	*b*
1.	$3+\square=3$	$7+0=\square$
2.	$2+\square=3$	$4-4=\square$
3.	$1+\square=3$	$9-\square=9$

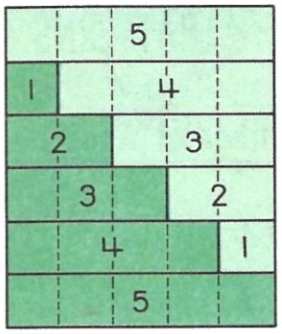
Can you do this? Solve each open sentence below. Replace both $\square$'s by the same numeral.

$5-\square=5+\square$ $\qquad$ $\square-0=\square+0$

Addition Pairs



$0+4=4$
$1+3=4$
$2+2=4$
$3+1=4$
$4+0=4$



$0+5=5$
$1+4=5$
$2+3=5$
$3+2=5$
$4+1=5$
$5+0=5$

Each of the addition numerals $1+3$, $2+2$, and $3+1$ name an *addition pair* for the number four.

How many addition pairs are given above for four?

How many addition pairs are given above for five?

Oral Answer each question.

1. How many addition pairs would you expect for six?

2. How many addition pairs would you expect for seven?

3. Which addition pairs for four have the same addends in different order?

4. Which addition pair for four uses the same addend twice?

5. Which addition pairs for five have the same addends?

6. What property of addition is shown by $2+3=3+2$?

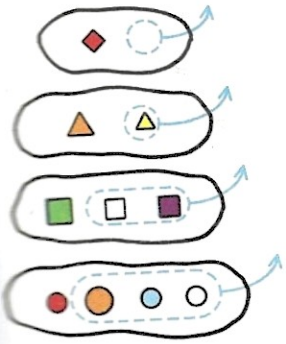
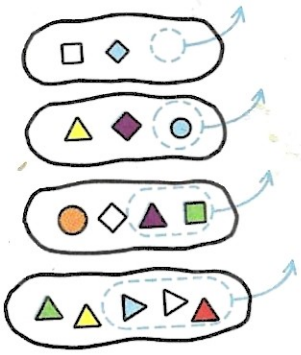
Written Write the addition pairs for these numbers.

	a	*b*
1.	six	seven
2.	eight	nine

Copy. Replace each $\square$ by the simplest numeral.

	a	*b*
3.	$3+5=\square$	$1+\square=5$
4.	$4+\square=6$	$\square+2=8$
5.	$\square+7=9$	$6+3=\square$
6.	$3+\square=7$	$5+\square=7$
7.	$4+4=\square$	$\square+1=6$

Subtraction Pairs

A	B
 1 – 0	 2 – 0
2 – 1	3 – 1
3 – 2	4 – 2
4 – 3	5 – 3

What number is named by each subtraction numeral in column A above? What is the simplest numeral for that number? Is $5-4$ also a name for that number? Give 3 more subtraction numerals for that number.

Every number has many subtraction numerals.

Oral Use column B above to answer the following.

1. What number is named by each subtraction numeral?
2. What is the simplest numeral for that number?

Written Write the answers for each of the following.

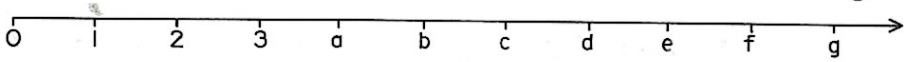
1. All of the addition numerals for three
2. Five subtraction numerals for three

Copy. Solve each of the following open sentences.

	a	*b*
3.	$8-5=\square$	$7-2=\square$
4.	$6-4=\square$	$9-3=\square$
5.	$7-1=\square$	$5-2=\square$
6.	$8-8=\square$	$3-0=\square$
7.	$6-3=\square$	$8-2=\square$
8.	$4-2=\square$	$9-5=\square$
9.	$5-1=\square$	$7-6=\square$

Number Lines

The following is called a **number line.** That part of the line from any mark to the next is called a *segment.* All segments on the number line have the *same* length.

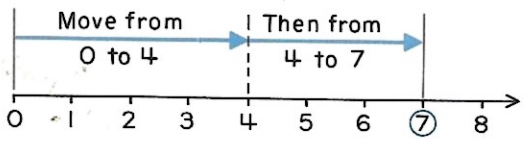


A move from 0 to 1 represents the number one.

A move from 0 to 2 represents the number two.

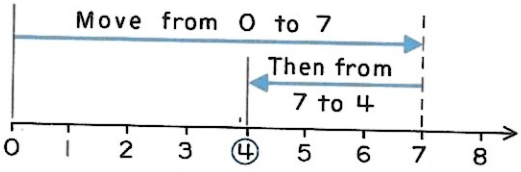
Which number is represented by a move from 0 to 3? From 0 to a? From 0 to c? From 0 to f?

How many segments do you move altogether when you move first from 0 to b and then from b to f? When you move first from 0 to a and then from a to f?



What single move could you make to reach 7? We can write this as:

$$4+3=7$$



What single move could you make from 7 to reach 4? We write this as:

$$7-3=4$$

Oral Use the number lines above to answer the following.

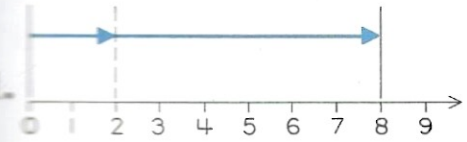
1. Do you think of addition or subtraction when moving to the right on a number line? When moving to the left?

2. What closed sentence would you use for moving from 0 to 3 and then from 3 to 8? For moving from 0 to 5 and then from 5 to 8? What property of addition does this illustrate?

3. Where on the number line should you start so that you can reach 8 by moving 3 more segments to the right? Would $\square+3=8$ be another way to ask the same question? Would $\square=8-3$ be still another way to ask the same question?

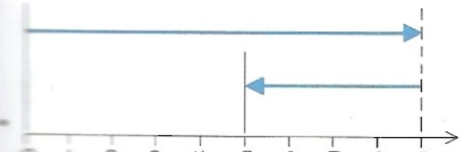
Written Study each number-line drawing. Then copy the open sentence and replace $\square$ by the simplest numeral.

1.



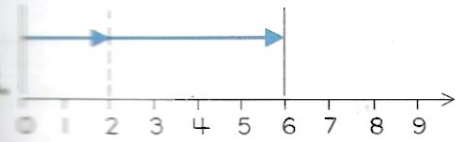
$2+6=\square$

2.



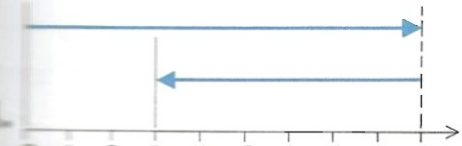
$9-4=\square$

3.



$\square+4=6$

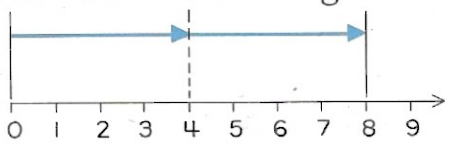
4.



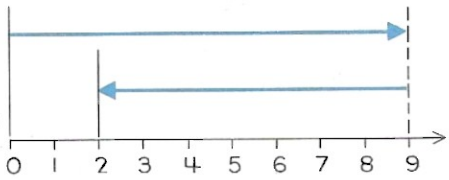
$\square-6=3$

Write a closed sentence for each number-line drawing below.

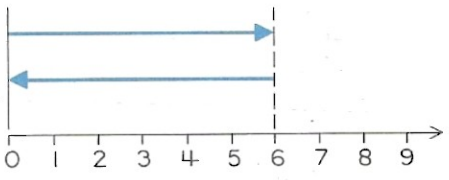
5.



6.



7.



Make a number-line drawing to solve each open sentence below.

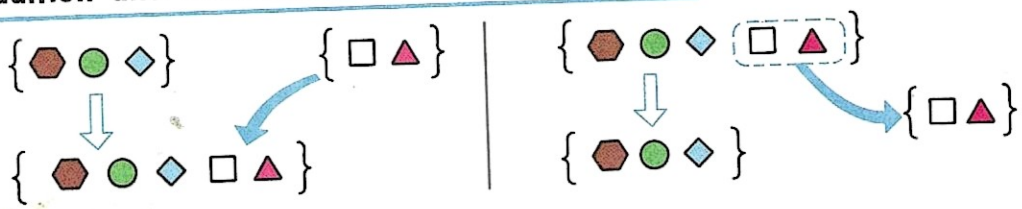
	a	*b*
8.	$6+3=\square$	$9-3=\square$
9.	$\square+2=7$	$7-\square=5$

Can you do this? If you can move *at most* 3 segments in a single move, what is the least number of moves needed to get from 0 to 7? From 2 to 8? From 5 to 9?

If you can move *at most* 4 segments in a single move, what is the least number of moves needed to get from 7 to 3? From 9 to 0? From 8 to 2?

MORE PRACTICE PAGE 299

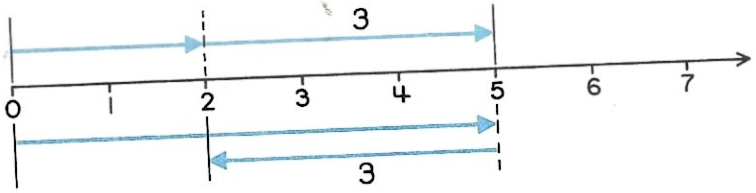
Addition and Subtraction as Inverse Operations



If $3+2=5$ _____ then $5-2=3$.

Does separating the union set *undo* the joining of the sets? Does subtracting 2 *undo* adding 2?

Suppose the set of 5 was separated into subsets first. Does joining the subsets undo the separating? Does adding 2 undo subtracting 2?



Does subtracting 3 undo adding 3? Does adding 3 undo subtracting 3?

Addition and subtraction undo each other. We say that addition and subtraction are **inverse operations.**

Oral Tell how you would undo each of the following.

1. Stand up
2. Put on your coat
3. Shut the door
4. Wake up
5. Take 5 steps forward
6. Subtract 7
7. Add 8
8. Subtract 9
9. Add 5

Written Find each difference by finding the unnamed addend.

	a	*b*
1.	$\square + 3 = 8$	$8 - 3 = \square$
2.	$\square + 4 = 6$	$6 - 4 = \square$
3.	$\square + 7 = 9$	$9 - 7 = \square$
4.	$\square + 5 = 9$	$9 - 5 = \square$
5.	$\square + 0 = 7$	$7 - 0 = \square$
6.	$\square + 6 = 6$	$6 - 6 = \square$

Think of addition pairs to help you find each difference.

	a	*b*
7.	$7 - 3 = \square$	$5 - 4 = \square$
8.	$6 - 1 = \square$	$4 - 1 = \square$
9.	$2 - 2 = \square$	$9 - 8 = \square$
10.	$9 - 3 = \square$	$6 - 3 = \square$
11.	$8 - 5 = \square$	$7 - 5 = \square$

Write 2 open sentences, an open addition sentence and an open subtraction sentence for each of the following problems. Solve either open sentence. Answer the problem.

12. Richard had 3 merit badges on his scout shirt. After his mother sewed on some more, he had 7 merit badges on his shirt. How many badges did his mother sew on?

13. Alice had 9 new pennies altogether. She had 6 of them in her purse and the rest in her hand. How many pennies did she have in her hand?

14. Scott had 8 pieces of candy when he left the party. He ate 3 pieces on the way home. How many pieces of candy did he have when he got home?

15. Miss Blake had 9 pictures to put up in the room. She put 5 of the pictures on the bulletin board and the rest on the chalkboard. How many pictures did she put on the chalkboard?

16. Mark and his father caught 9 fish. Three of them were too small to keep, and they threw them back into the water. How many fish did they keep?

Tell why If you know any 1 of the following facts, you also know all the others. Tell why.

$5 + 3 = 8 \longrightarrow 8 - 3 = 5$

$3 + 5 = 8 \longrightarrow 8 - 5 = 3$

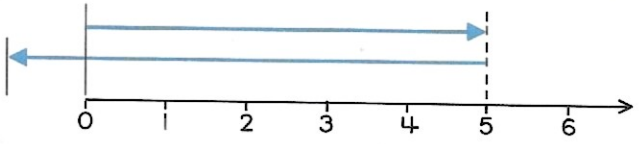
MORE PRACTICE PAGE 300

Subtraction Numerals

What numbers are named by these subtraction numerals?

$5-0$	$5-2$	$5-4$
$5-1$	$5-3$	$5-5$

Study the number line drawing for $5-6=\square$.



Is $5-6$ a subtraction numeral? Does $5-\square$ name a whole number if $\square$ is replaced by 0? By 1? By 2? By 3? By 4? By 5? By 6?

What different numerals could replace $\square$ to make $4-\square$ a name for a whole number?

Oral Which of the following subtraction numerals name whole numbers?

	a	*b*	*c*
1.	$8-4$	$3-5$	$7-0$
2.	$6-6$	$9-8$	$5-7$

What numerals could replace $\square$ to make each of the following name a whole number?

	a	*b*	*c*
3.	$3-\square$	$\square-5$	$7-\square$
4.	$\square-0$	$2-\square$	$1-\square$

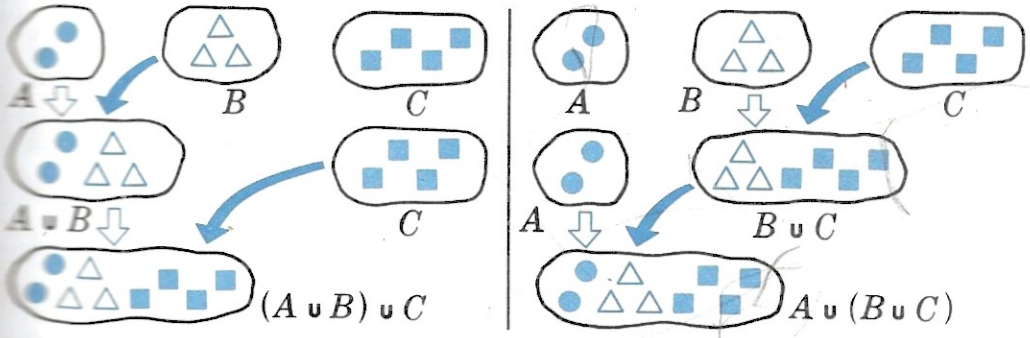
Written For each problem, write a subtraction sentence. Solve the open sentence. Write an answer for the problem.

1. Pam had 9 cookies. She ate 2 of them. How many cookies did she have left?

2. Jim caught 7 butterflies. Then 3 of them got away. How many did he have left?

3. Robert lost 4 of his 7 pennies. How many pennies did he have left?

The Union of 3 Sets



Study how the sets are joined. The parentheses ( ) in $(A \cup B) \cup C$ show that sets A and B are joined first, then set C is joined to $A \cup B$. The ( ) in $A \cup (B \cup C)$ show that sets B and C are joined first, then $B \cup C$ is joined to set A.

Do $(A \cup B) \cup C$ and $A \cup (B \cup C)$ have the same number? Does the way in which 3 sets are joined change the union set?

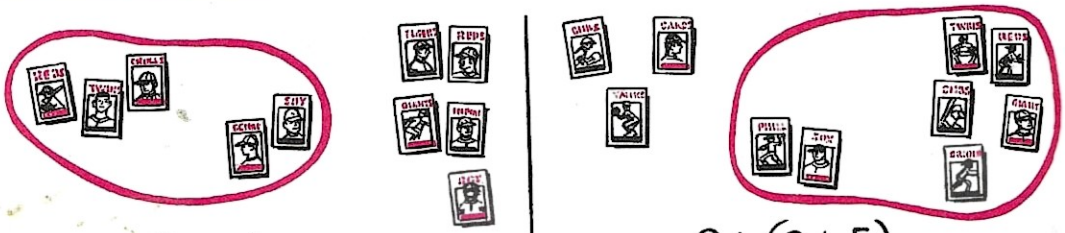
Oral Think of joining the sets as indicated below. Tell the number of each union set.

	a	*b*
1.	$(A \cup B) \cup C$	$A \cup (B \cup C)$
2.	$(A \cup C) \cup B$	$A \cup (C \cup B)$
3.	$(B \cup C) \cup A$	$B \cup (C \cup A)$
4.	$(B \cup A) \cup C$	$B \cup (A \cup C)$
5.	$(C \cup A) \cup B$	$C \cup (A \cup B)$
6.	$(C \cup B) \cup A$	$C \cup (B \cup A)$

Written Refer to the set unions in *Oral* and find the sum for each of the following.

	a	*b*
1.	$(2+3)+4=$	$2+(3+4)=$
2.	$(2+4)+3=$	$2+(4+3)=$
3.	$(3+4)+2=$	$3+(4+2)=$
4.	$(3+2)+4=$	$3+(2+4)=$
5.	$(4+2)+3=$	$4+(2+3)=$
6.	$(4+3)+2=$	$4+(3+2)=$

Addition Is Associative



$(3+2)+5$ $\qquad$ $3+(2+5)$

Bill had 3 baseball cards. He got 2 more from Tom. Then he got 5 more from Dick. How many baseball cards did he have then?

Since the sets of cards are to be joined, we think of adding their numbers. An open sentence would be

$$3+2+5=\square.$$

To show that Bill first got 2 cards from Tom and then 5 from Dick, use parentheses ( ) like this:

$$(3+2)+5$$

What number does $(3+2)$ name?

Suppose Dick gave his cards to Tom first, and then Tom gave Bill all of the cards that he and Dick had. You can show this as:

$$3+(2+5)$$

What number does $(2+5)$ name?

Is $(3+2)+5=3+(2+5)$?

When adding 3 numbers, you may group the first 2 addends or the last 2 addends and always get the same sum. We call this idea the **associative property of addition.** Or we say that *addition is associative.*

Oral Answer the following questions about $(4+3)+1$.

1. What number is named by $(4+3)$?

2. What number is named by $(4+3)+1$?

Now answer the following questions about $4+(3+1)$.

3. What number is named by $(3+1)$?

4. What number is named by $4+(3+1)$?

5. Do the numerals occur in the same order in $(4+3)+1$ and $4+(3+1)$?

6. $(4+3)+1 = 4+(3+1)$ shows which property of addition?

Written Copy the numerals in the first column below. Place ( ) in so it becomes

1. $2+5+1$	$2+6$
2. $3+1+4$	$4+4$
3. $2+5+2$	$2+7$
4. $5+1+2$	$5+3$
5. $7+1+1$	$7+2$
6. $7+1+1$	$8+1$

Copy. Find each sum.

	a	*b*
7.	$3+5+1=\square$	$1+6+2=\square$
8.	$4+1+4=\square$	$2+3+2=\square$
9.	$2+6+0=\square$	$3+1+3=\square$
10.	$5+2+1=\square$	$4+2+2=\square$
11.	$2+3+4=\square$	$5+3+2=\square$

Write an open sentence for each problem. Solve the open sentence. Write an answer for the problem.

12. Arthur saw 2 sparrows, 1 bluebird, and 5 robins on the lawn. How many birds did he see in all?

13. Alice spent 3 pennies for a pencil, 5 pennies for candy, and 1 penny for gum. How many pennies did she spend?

14. Roger has 3 marbles in his pocket, 4 in his hand, and 1 on the ground. How many marbles does he have altogether?

15. June used 2 green balloons, 2 red balloons, and 3 yellow balloons for her party. How many balloons did she use in all?

Adding Three Numbers

Think about adding three numbers, such as 3+4+2.

You can start by adding either the first two numbers or the last two numbers. What property of addition is this?

You can change the order of any two addends. What property of addition is this?

Using these two properties, you have these choices for adding the three numbers.

2+(3+4)	4+(2+3)	3+(2+4)
(2+3)+4	(4+2)+3	(3+2)+4
2+(4+3)	4+(3+2)	3+(4+2)
(2+4)+3	(4+3)+2	(3+4)+2

Addends can be arranged in any way without changing the sum.

Oral Which two numbers are to be added first in each of the following?

	a	*b*
1.	(2+1)+5	1+(5+2)
2.	(2+5)+1	5+(2+1)

Written Copy. Find each sum.

	a	*b*
1.	(3+1)+4=□	4+(3+1)=□
2.	(1+3)+4=□	4+(1+3)=□
3.	(3+4)+1=□	1+(3+4)=□
4.	(4+3)+1=□	1+(4+3)=□
5.	(1+4)+3=□	3+(1+4)=□
6.	(4+1)+3=□	3+(4+1)=□

Can you do this? Show the 12 ways in which the numbers 1, 2, and 3 may be added. Use the pattern shown at the top of the page if you need help.

MORE PRACTICE PAGE 300

Replacement Sets

The closed sentences following each set are formed by replacing $\square$ in $2+\square=5$ by one of the numerals used to name the numbers in that set. The closed sentences are listed as *True* or *False*.

True	*False*
$2+3=5$	$2+0=5$
	$2+1=5$
	$2+2=5$
	$2+4=5$
	$2+5=5$
	$2+6=5$
	$2+7=5$
	$2+8=5$
	$2+9=5$

True	*False*
$2+3=5$	$2+1=5$
	$2+5=5$
	$2+7+5$
	$2+9=5$

True	*False*
	$2+0=5$
	$2+2=5$
	$2+4=5$
	$2+6=5$
	$2+8=5$

The set of numbers whose numerals are used to replace $\square$ in an open sentence is called the **replacement set.** Any number in the replacement set whose numeral makes the closed sentence true is called a **solution.**

Oral Answer the following.

1. Does the sentence $2+\square=5$ have a solution when set A is used as the replacement set?

2. Does the sentence $2+\square=5$ have a solution when set B is used as the replacement set? When set C is used as the replacement set?

Written Use $\{0, 1, 2, 3, 4, 5, 6\}$ as the replacement set. Which of the following have a solution? Find the solution.

	a	*b*
1.	$3+\square=8$	$\square+7=9$
2.	$6-\square=5$	$\square-5=4$
3.	$2+3=\square$	$8-7=\square$

Inequalities

$3<5$	*Three is less than five.*
$\square<4$	*Some number is less than four.*
$6>1$	*Six is greater than one.*
$2>\square$	*Two is greater than some number.*
$2+\square<5$	*Two plus some number is less than five.*

Each of the sentences above uses the $<$ or the $>$ symbol. These sentences are called **inequalities.**

Is $3<5$ true or false? Is it an open or a closed sentence? Why?

Is $\square<4$ true or false? You cannot decide whether it is true or false until $\square$ is replaced by a numeral. Is it an open or a closed sentence?

Use {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} as the replacement set. Try these replacements one by one to find which ones make $\square<4$ a true sentence.

True sentences	False sentences
$0<4$, $1<4$	$4<4$, $5<4$, $6<4$
$2<4$, $3<4$	$7<4$, $8<4$, $9<4$

What are the solutions of $\square<4$?

Use {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} as the replacement set. Try these replacements one by one to find the solutions of $1+\square<5$. How many solutions are there?

Use {0, 2, 4, 6} as the replacement set. Try these replacements one by one to find the solutions of $1+\square>8$. How many solutions are there?

Oral Read each of the following sentences.

	a	*b*	*c*
1.	$3<7$	$5>2$	$0<1$
2.	$9>7$	$3<7$	$1>0$

Written Copy. Replace each ● with $<$ or $>$ so the resulting sentence is true.

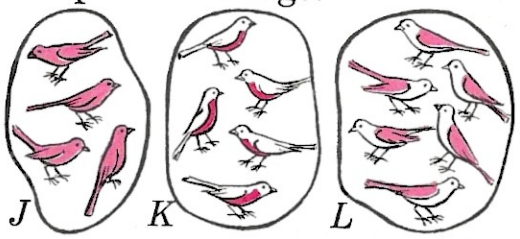
	a	*b*
1.	$5 \bullet 2$	$3+2 \bullet 6$
2.	$4 \bullet 9$	$9-7 \bullet 0$
3.	$1 \bullet 3$	$4+3 \bullet 5$
4.	$3 \bullet 0$	$6-1 \bullet 8$

Use {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} as the replacement set. Find all of the solutions of each of the following inequalities.

	a	*b*
5.	$\square+3<8$	$6-\square>5$
6.	$5+\square>7$	$\square-4<5$
7.	$3+2<\square$	$9-3>\square$
8.	$4+\square<4$	$8-\square<3$
9.	$\square+2>2$	$\square-4>6$
10.	$5+3<\square$	$4-3>\square$

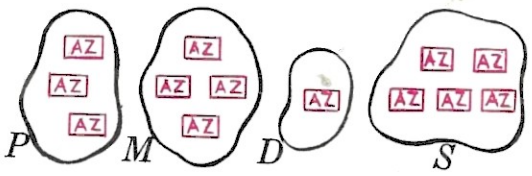
Read each problem carefully. Write an answer for the problem.

11. Mary can have at most 8 birds in her cage. She already has 3 birds in the cage. Which of the following sets could she still put in the cage?



12. John needed 8 more pennies to buy a model airplane. He found some pennies, but not enough. Which of the following sets of coins could he have found?

13. In order to win a prize, Jean had to have at least 9 AZ box tops. She already has 5 AZ box tops. Which of the following sets could she also have to win a prize?



MORE PRACTICE PAGE 300

Combined Addition-Subtraction Sentences

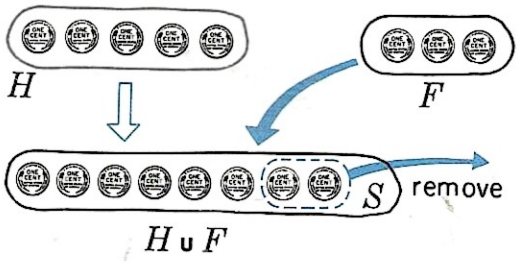
John had 5 pennies. He found 3 more. Then he spent 2 pennies. How many pennies did he have left?

Think of the 5 pennies he had as set H.

Think of the 3 pennies he found as set F.

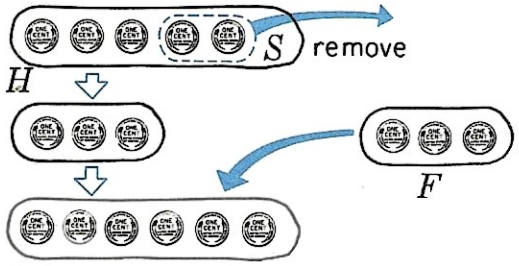
Think of the 2 pennies he spent as set S.

Some of the ways you may think about this problem are:



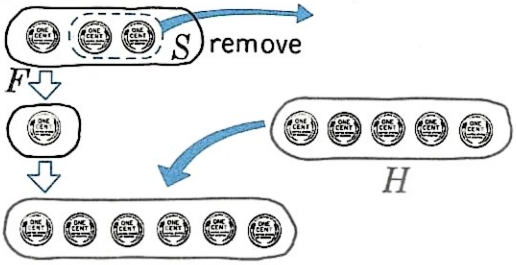
Join the pennies he found with those he had. Then remove the pennies he spent. The open sentence would be:

$(5+3)-2=\square$ or $(3+5)-2=\square$



Remove the pennies he spent from those he had. Then join the pennies he found. The open sentence would be:

$(5-2)+3=\square$ or $3+(5-2)=\square$



Remove the pennies he spent from those he found. Then join the pennies he had. The open sentence would be:

$(3-2)+5=\square$ or $5+(3-2)=\square$

Any of these open sentences is correct. Choose that sentence which is easiest for you.

Oral Answer the following.

1. Which property of addition allows you to change $(3+2)+1$ to $3+(2+1)$?

2. Is $4-(1+2)=(4-1)+2$? Is subtraction associative?

3. Which property of addition allows you to change $5+3$ to $3+5$? To change $(5+3)-2$ to $(3+5)-2$? To change $(3-2)+5$ to $5+(3-2)$?

Written Copy. Replace each $\square$ with the simplest numeral.

	a	*b*
1.	$(7-3)+4=\square$	$7-(3+4)=\square$
2.	$(6-3)+2=\square$	$6-(3+2)=\square$
3.	$8-(4+3)=\square$	$(8-4)+3=\square$
4.	$(9-2)+2=\square$	$9-(2+2)=\square$
5.	$5+(8-6)=\square$	$(7-4)+3=\square$
6.	$9-(6+1)=\square$	$7-(3+2)=\square$
7.	$4+(7-7)=\square$	$9-(5+4)=\square$

Write an open sentence for each problem. Solve the open sentence. Write an answer for the problem.

8. Richard left home with 3 sugar cookies and 4 chocolate cookies. On the way to the picnic he ate 2 of the cookies. How many did he have when he got to the picnic?

9. Carol found 5 Easter eggs in an old hat. She ate 2 of them. Then she found 4 more. How many eggs did she have then?

10. The mailman had 6 letters in his hand when he came to Mark's house. He left 4 letters and picked up 3 more. How many letters did he have then?

11. Bill caught 4 fish and Carl caught 3 fish. They ate 5 of the fish for dinner. How many fish were not eaten?

12. Susan invited 5 girls and 4 boys to her party. If 3 of her friends went home early, how many children stayed?

Can you do this? Write 3 names for each of the numbers zero through six by using any 3 of the numerals 1, 2, 3, 4, one + sign, one − sign, and ( ). For example, the following are some of the names for zero.

$(1+3)-4$ $\quad 4-(1+3)$ $\quad 4-(3+1)$
$3-(1+2)$ $\quad 3-(2+1)$ $\quad (2+1)-3$

MORE PRACTICE PAGE 301

Egyptian and Roman Numerals

The numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are not the only symbols used to name numbers. Addition and subtraction numerals may be used.

2+3	7−2	9−4
8−3	0+5	4+1

What number is named by each of the addition and subtraction numerals above? Is any of these numerals the simplest numeral for the number?

The Egyptians and Romans used different symbols than we do. Some of their number symbols are given below.

Egyptian Symbol	*Roman Symbol*	*Our Symbol*
		0
/	I	1
//	II	2
///	III	3
////	IV	4
/////	V	5
//////	VI	6
///////	VII	7
////////	VIII	8
/////////	IX	9
∩	X	10

The above symbols are called numerals. VII is a Roman numeral. ////// is an Egyptian numeral.

Did the Egyptians have a numeral for zero? Did the Romans?

Oral Use the lists of numerals on page 44 to answer these questions.

1. Where have you seen Roman numerals used?

2. How many different symbols did the Egyptians use to name the numbers one through ten? How many did the Romans use? How many do we use?

3. When the Egyptians used the symbol / twice, as in //, what number did they name? Is this true for the Roman symbol I, as in II? Is it true for our symbol 1, as in 11?

4. Whose numerals would you call the simplest? Why?

5. What number is named by IV? By I? By V? What operation could you perform on five and one to obtain four? Does IV mean 5−1?

6. What number is named by VI? What operation could you perform on five and one to obtain six? Does VI mean 5+1?

7. What does IX mean? What does XI mean?

Written Show the meaning of each Roman numeral below by writing a closed addition or subtraction sentence.

Roman Numeral	*Meaning*
1. II	1+1=2
2. III	1+1+1=3
3. IV	
4. VI	
5. VII	
6. VIII	
7. IX	

Write a Roman numeral for each of the numbers named below.

	a	*b*	*c*
8.	7−4	5+2	9−4
9.	6+3	5−1	6−4
10.	8−6	2+6	5−4

Can you do this? Answer each of the following.

1. Since II means 1+1=2, then XX means _____.

2. Since VIII means 5+3=8, then XIII means _____.

MORE PRACTICE PAGE 301

Odd and Even Numbers

0	1	2	3	4	5	6
0+0	0+1	1+1	1+2	2+2	4+1	3+3

For which addition numerals are both addends the same? An **even number** can be named as the sum of two addends that are the same. An **odd number** cannot be named as the sum of two addends that are the same.

Oral Answer the following.

1. If you had an even number of books, could you place them in stacks of 2 each and have no books left over?

2. What numbers could you subtract from 7 so the difference is an odd number?

3. What numbers could you add to 3 so the sum is an even number?

4. What is the least number you could add or subtract from an odd number so the result is an even number?

5. Which number must be added to an even number in order to obtain the next even number?

Written In problem 1 both addends are even numbers. In problem 2 both addends are odd numbers. In problem 3 one addend is even and the other is odd. Find each sum.

	a	*b*
1.	2+4=□	4+4=□
2.	1+3=□	3+5=□
3.	1+4=□	2+5=□

Complete each sentence.

4. The sum of 2 even numbers is an _____ number.

5. The sum of 2 odd numbers is an _____ number.

6. The sum of an odd and an even number is an _____ number.

Checkup Time

The numerals in ( ) tell the pages where you can turn for help if you need it.

Important Ideas

1. Zero is the identity number of addition. (27)

2. Addition and subtraction are inverse operations. (32, 33)

3. Addition is associative. (36-38)

4. Any number in the replacement set whose numeral in place of ☐ changes an open sentence to a true closed sentence is called a solution. (39)

Words to Know

1. Identity number (27)

2. Number line (30)

3. Inverse operations (32)

4. Associative property of addition (36)

5. Replacement set, solution (39-40)

6. Inequality (40)

7. Odd and even numbers (46)

Questions to Discuss

1. How would you show "add 3" on a number line? How would you show "subtract 5"? (30)

2. How may you proceed to add three numbers? (38)

3. Is 4 a solution of the open sentence $9-\square=5$? Why or why not? (39)

4. Which operation should be done first when solving the equation $(5+4)-6=\square$? (42)

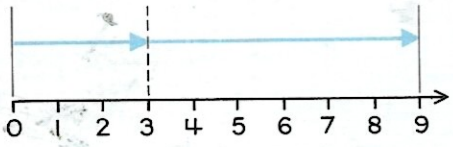
Written Practice

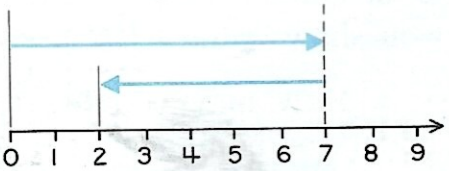
Use {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} as the replacement set. Copy and solve each open sentence.

1. $7+\square=7$ (27)
2. $9-6=\square$ (32)
3. $(1+2)+6=\square$ (36)
4. $\square+2<6$ (41)
5. $\square-3>2$ (41)
6. $(5-2)+4=\square$ (43)

Self-Evaluation

Part 1 Write a true closed sentence for each number-line.

1. 

2. 

Make a number-line drawing to solve each open sentence below.

	a	*b*
3.	$2+7=\square$	$8-3=\square$
4.	$\square+4=6$	$6-\square=1$

Part 2 Copy. Solve each open sentence.

	a	*b*
1.	$(3+2)+4=\square$	$\square=(1+3)-2$
2.	$5+(2+1)=\square$	$\square=3+(9-7)$

Use $\{0, 3, 4, 5, 6, 7, 8\}$ as the replacement set. Solve each open sentence below.

	a	*b*
3.	$5+\square=8$	$2+\square<6$
4.	$\square-4=1$	$9-\square>1$

Part 3 Write an open sentence for each problem. Solve each open sentence. Write an answer for each problem.

1. James caught 7 frogs and put them in a pail. When he got home there were only 3 frogs in the pail. How many frogs got away?

2. Mr. Brown said that 5 days of the week had passed and 2 days were left. How many days are there in a week?

3. Caroline put 3 red crayons and 5 green crayons in an empty box. Later she took 4 crayons out of the box. How many crayons remained in the box?

4. Jane worked some of the 9 problems on a math test. Of those she worked, she had 6 right and 2 wrong answers. How many answers were not given?

5. Roger took 8 steps forward, 5 steps back, and then 4 steps forward. The result was the same as taking how many steps in which direction?

Tables of Measures

Use the tables of measures below for quick reference or for review. The = sign is used to mean *is equivalent to*.

Length (English)

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
36 inches = 1 yard
5280 feet = 1 mile

Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day
7 days = 1 week
12 months = 1 year (yr.)
365 days = 1 year
366 days = 1 leap year

Length (Metric)

10 millimeters = 1 centimeter
10 centimeters = 1 decimeter
10 decimeters = 1 meter

Liquid

1 cup = $\frac{1}{2}$ pint (pt.)
2 cups = 1 pint
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Weight

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton

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